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Population and Human Resources
Department
The World Bank
November 1992
WPS 1037

Vocational Secondary Schooling, Occupational Choice, and Earnings in Brazil

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and
Adrian Ziderman

As part of a "new wave" of studies on the efficacy of vocational school, this one reports the finding that students who complete vocational school and work in a related field earn more than vocational students who work in unrelated fields and more than academic graduates.

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This paper — a product of the Education and Employment Division, Population and Human Resources Department — is part of a larger effort in the department to provide policy guidance for vocational and technical education and training. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Cynthia Cristobal, room S6-214, extension 33640 (November 1992, 16 pages).

Empirical studies on the efficacy of vocational education, mainly in developing countries — a literature now comprising dozens of evaluation studies — have been fairly unanimous in recording a negative verdict on the costs and benefits of vocational secondary education, particularly compared with traditional academic school.

Arriagada and Ziderman, in this study set in Brazil, reach a different conclusion.

Like a number of recent evaluation studies (for Hong Kong, Israel, and the United States), this one challenges the established orthodoxy by reporting findings far more supportive of vocational schooling. Unlike traditional approaches, it focuses on the relationship between field of vocational study and subsequent occupation.

Arriagada and Ziderman report that students who complete vocational school and work in related fields have significant earnings advantages over students who do not work in fields related to what they studied and over students who complete academic school.

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by

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Introduction

A major theme in the economics of education literature over the past quarter of a century has been the empirical examination of the efficacy of vocational education, mainly in developing countries. Initiated by Foster's classic study of vocational schooling in Ghana in the years following independence (Foster 1965), this literature, now comprising dozens of empirical studies, has been fairly unanimous in recording a negative verdict on vocational secondary education in cost-benefit terms, particularly in relation to more traditionally academic forms of secondary schooling. Summaries of this literature are given in Zymelman (1976), Metcalf (1985), Psacharopoulos (1987) and Tilak (1988).

More recently, a number of evaluation studies have challenged the established orthodoxy in adducing findings far more supportive of vocational schooling. Set in the US, Israel and Hong Kong these studies have departed from traditional approaches by focussing on the relation between vocational field of study and subsequent occupation. They report significant earnings advantages for vocational school completers working in related fields compared both to those who do not work in related fields and also to academic school completers. Fredland and Little (1980) contrasted the earnings of "users" and "non-users" of vocational education in the actual job of a sample of males from the National Longitudinal Survey in the US. Rumberger and Daymont (1984) matched vocational education credits in school with current fields of work. Neuman and Ziderman (1991) examined the earnings effects of vocational school completers in "matched" and "non-matched" occupations in a sample of prime age males in Israel. Chung (1990) compared the earnings of vocational school "users" to those of "non-users" and academic school graduates in a subsample of males of the Hong Kong population census.

Thus all these studies report results that are far more favorable to vocational schooling than is the main thrust of the traditional evaluation literature. In this paper, a parallel methodology is applied to Brazilian data. The results reported in this paper are in broad conformity with those of the new wave of studies, in showing earnings advantages to vocational school completers who are employed in "matched" occupations.

1. Trends in Vocational Schooling

Based on an analysis of UNESCO enrollment data, Benavot (1983) examined the vocational enrollment ratio (the proportion of secondary school pupils enrolled in vocational schools) over time. He found a general shift away from vocational schooling in relative terms since the mid-1950, a finding consistent with the negative results for vocational schooling from evaluation studies. We report below a reexamination of these trends for the period 1960-1984, based on unweighted vocational enrollment ratios for 65 countries[1].

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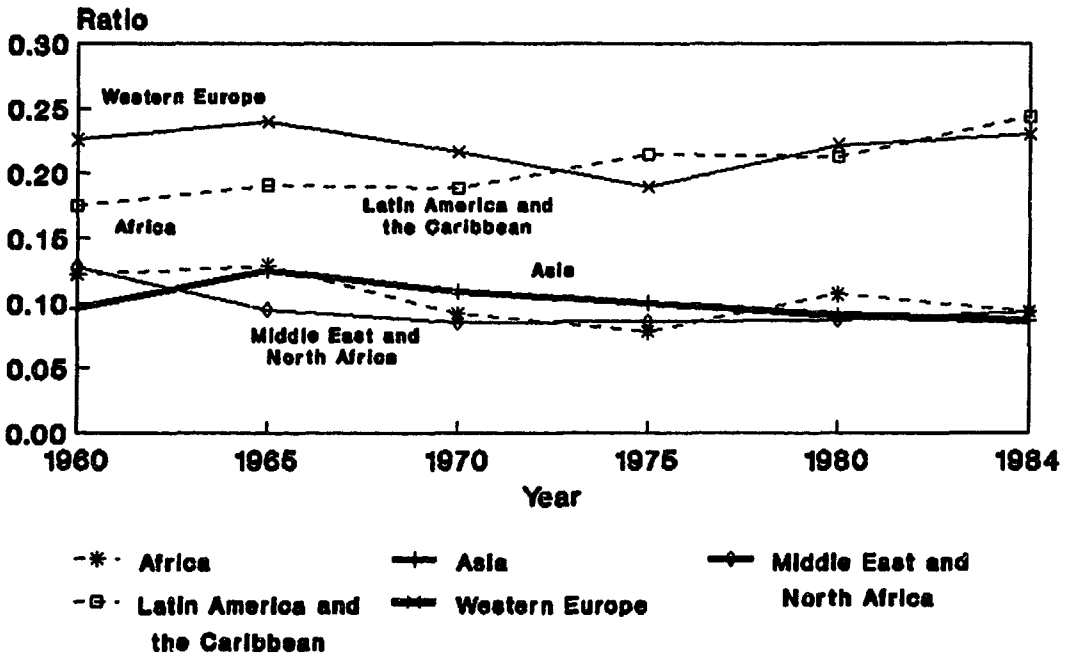
[1] This discussion is drawn from Middleton, Ziderman and Adams (1992). To compute the average unweighted vocational enrollment ratio for a region or a country group by income level, a simple average of individual vocational enrollment ratios is taken for the countries of interest; thus the experience of each country, regardless of size, is accorded equal weight in the overall enrollment ratio average.

Looking at regional trends (Chart 1), decreasing vocational schooling ratios (though not absolute numbers) is the prevalent pattern, except in Eastern Europe (not shown) and in Latin America, where the ratio is also more than double that in other developing country regions.

Chart 1

Vocational Enrollment Ratio by Region



Trends over the period 1960-1984 differ markedly in low and middle income countries (Chart 2 and 3)[2]. In low income countries, as total secondary school enrollment (as a proportion of the age population of secondary school age) rose from three to about 20 percent, the vocational schooling ratio declined from 19 percent leveling off to 8 percent. Thus the albeit slow growth in secondary schooling in low income countries has taken place primarily in the academic/general streams.

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[2] We use World Bank categories: low income countries are those with a GNP per capita below $1,810 in 1986: middle income countries have a GNP per capita in the range $1,810 - $7,410.

Chart 2

Low Income Countries

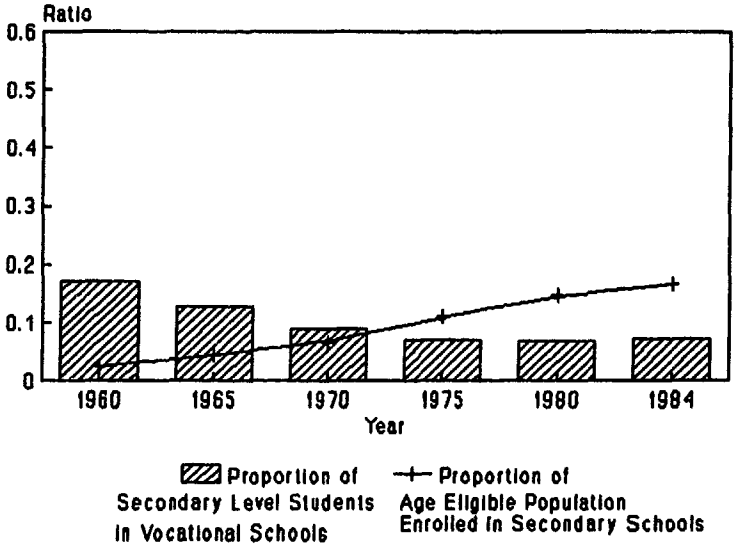
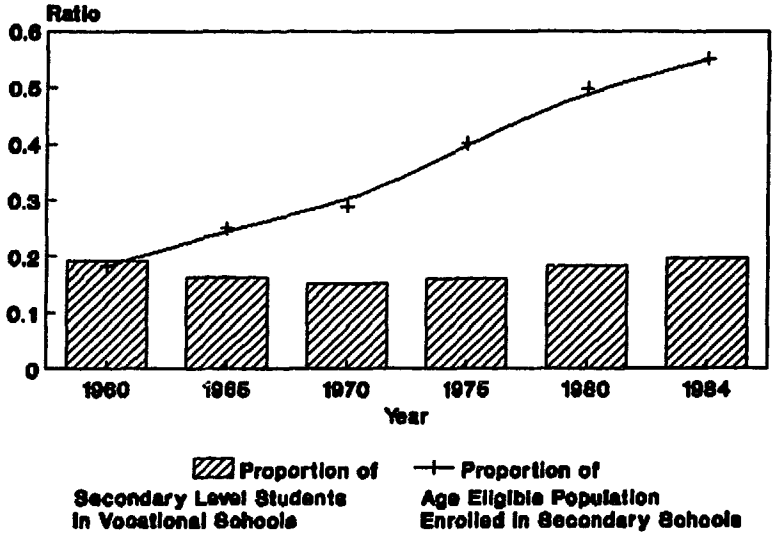


Chart 3

Middle Income Countries
(Excluding E.Europe)



The pattern is different for the middle income countries group, to which Brazil belongs. Here, the share of total secondary enrollments in vocational schools has remained fairly constant, hovering at around 20 percent, while overall secondary school enrollments as a proportion of the relevant age group has risen dramatically from 18 to 55 percent. This indicates that vocational schooling in middle income countries generally has expanded at about the same rate as the secondary school system as a whole. We shall comment further on this more favorable experience in middle income countries, in the concluding section. But first, we consider the case of Brazil.

2. Vocational Schooling in Brazil

The average educational attainment of the Brazilian population lags substantially behind that of other middle income countries. In 1980, the mean years of schooling of the male labor force was about 5.6 years with 67.9 percent of the male workers having less than secondary schooling (Psacharopoulos and Arriagada, 1986). Available data for secondary school enrollment suggest that there has been a general underinvestment in this level of education in Brazil. In 1987, enrollments at the secondary level represented only 37 percent of the school age population compared to 59 percent for other middle income countries. Table 1 presents secondary school enrollment rates for selected countries.

Table 1
Secondary School Enrollment Rates
Selected countries
(1965 and 1986)

Country	1965 %	1986 %
Brazil	16	37
Korea	35	95
Chile	34	70
Mexico	17	55
Average Upper Middle-income Countries *	29	59

Source: World Bank (1989)
* Defined as per capita GDP between US$ 1,810 and $ 7,410 in 1986.

Available analyses of secondary schooling in Brazil indicate that the system experienced rapid growth between the 1960s and 1970s, averaging 11 percent a year between 1960 and 1980, and

stagnation of such growth since 1980[3]; this expansion appears to have been accompanied by increased diversity of curriculum, administration, unit costs by type of school, inequitable allocation of resources across schools, and school quality differences, which are partly the result of a long term lack of public policy with regard to secondary education. There has been an expansion of nonformal programs provided by the major training institutions Servicio Nacional de Aprendizagem Industrial (SENA) and Servicio Nacional de Aprendizegem Commercio (SENAC) over the last two decades.

Brazilian vocational education at the secondary school level is provided by all three levels of government: federal, state and municipal as well as outside the formal education system by SENAI and SENAC. Over 96 percent of public secondary school enrollment and 75 percent of total secondary school enrollment is located in state/municipal schools. These schools offer academic and vocational programs leading to a general secondary diploma. Vocational students may specialize in the following major fields: agriculture, industrial, accounting, pedagogical, and para-medical[4]. Most state schools in Brazil offer vocational and academic curriculum fields in the same schools and the unit costs of the former are likely to be similar to those of academic education, particularly in those vocational education fields that do not require special machinery or equipment.

Table 2
Public Secondary Schooling in Brazil
Enrollment and Expenditures by Type of School
(1985)

Type of School	Enrollment 1985	%	Number of Schools	Per student cost US$
Federal Technical	67,657	3.4	137	1,759
Agricultural	13,568	0.7	-	2,727
Industrial	54,089	2.7	-	1,516
State/Municipal*	1,912,488	96.2	5,059	249
State	1,780,155	89.6	4,421	257
Municipal	132,333	6.7	638	136
SENAI Secondary	7,543	0.4	-	1,880

Source: World Bank (1989)
- Not available.
* cost figures relate to both technical and academic schools.

[3] World Bank (1989), p.i.

[4] In detail, the fields offered are: industrial electrical, industrial mechanics, industrial chemical, industrial textile, architectural design, agriculture, accounting, secretarial, administration, insurance, and para-medical.

Unfortunately, there is no up to date research on the labor market outcomes of vocational secondary schooling in Brazil. The only research available refers to nonformal training, and covers SENAI graduates in the early 1970s (de Moura Castro, 1979). This study yielded high estimates of social rates of return: 24 percent for those who received SENAI training after four years of primary schooling, 12 percent for those who received SENAI training after eight years of schooling, and 23 percent for those who received SENAI training after secondary school.

3. Labor Market Outcomes of Secondary Schooling

Data

The data source is a nationally representative subsample of males drawn from the 1980 Brazilian Population Census. The sample was restricted to males between the ages of 15 and 65, who attended secondary and were working full time (36 hours per week or more in the week prior to the census) in private sector wage employment[5]. The Census questionnaire gathered information on years and type of terminal schooling. This information was used to distinguish between academic and vocational secondary school leavers (i.e. those that terminated full time education at secondary level). While the Census questionnaire did not gather explicit information on the type of school attended by secondary school leavers (this is inferred from courses of study), available information presented in Table 2 enables us to believe that the majority of the individuals who received vocational schooling in our sample come from state/municipal schools. In all, 2,743 individuals were included in the final sample: of these, nearly 407 (some 15 percent) received vocational schooling.

Table 3 presents the characteristics of the sample of secondary school leavers as a whole, and by type of schooling attended. It appears that most personal characteristics (age, experience, migrant origin) are similar for vocational and academic leavers. The two groups differ in the amount of schooling attained, where vocational school leavers have over 1.5 more years than their academic counterparts. There are also some differences between the two groups in terms of the distribution by occupation and earnings. Clerical work, followed by professional/technical work, are the main occupations for vocational leavers while production and clerical work are the main occupations for those of academic fields. On average, vocational school leavers appear to earn about 6,000 cruzados more per month than their academic counterparts.

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[5] Originally we worked with the full sample of salaried workers employing a dummy variable = 1 if employed in the public sector. However, the estimation of F test indicated that the samples of private and public sector workers come from different populations, which conform with available evidence on the operation of labor markets in Brazil.

Table 3
Distribution of the Sample by Type of Secondary Schooling
(Means and standard deviations)

Characteristics	Whole Sample		Vocational		Academic	
	Mean	sd.	Mean	sd.	Mean	sd.
Number observations	2,743		407		2,336	
Age	29.04	9.52	30.18	8.72	28.84	9.64
Experience	13.25	9.34	12.87	8.56	13.32	9.47
Monthly earnings (Cruzados)	18,495	18,635	23,686*	21,545	17,590*	17,932
Schooling						
Secondary academic	0.84					
Secondary vocational	0.16					
Years of schooling	9.78	1.43	11.31*	0.55	9.51	1.37
Yrs. industrial			11.23	0.77		
Yrs. accounting			11.37	0.48		
Yrs. other vocational			11.19	0.43		
Occupation						
Farm worker	0.02		0.01*		0.02	
Production worker	0.27		0.17*		0.28	
Sales worker	0.12		0.12		0.13	
Service worker	0.13		0.04*		0.15	
Clerical worker	0.26		0.35*		0.25	
Professional/technical	0.13		0.25*		0.12	
Non-defined occupation	0.07		0.04		0.04	
Location						
North	0.01		0.01		0.01	
North-east	0.13		0.17*		0.12	
South-east	0.64		0.53		0.66	
South	0.17		0.19		0.16	
Central-west	0.05		0.09*		0.04	
Other variables						
Social security	0.92		0.96*		0.91	
Migrant	0.55		0.55		0.54	

* Significant at the .001 level or better. Differences between means were tested employing t-tests.

Methodology

The analytical framework for this study is the traditional Mincerian earnings function (Mincer 1974). The log of monthly earnings is run against a set of spline variables (SPLYRSC) describing the number of years of schooling attained in the secondary school field of study (academic, industrial, accounting, pedagogical and other vocational courses). We chose to use of spline variables for years of education because they provide direct estimates of the returns to an additional year of schooling in each field of study. We control for several explanatory variables relating to personal and background characteristics and labor market features. Direct comparisons of the coefficients on the secondary school splines show whether vocational leavers earn more than their academic counterparts; they also indicate any earnings differences between the various fields of vocational schooling.

The full set of variables employed in the regressions are as follows:

SPLYRSC2	Years of academic secondary schooling
SPLYRSC3	Years of industrial secondary schooling
SPLYRSC4	Years of accounting secondary schooling
SPLYRSC5	Years of other vocational secondary schooling
EXPER	Years of experience defined as Age - Schooling years - 6
PRODW [6]	Dummy variable = 1 if Production worker, 0 otherwise
FARMW	Dummy variable = 1 if Farm worker, 0 otherwise
SALES	Dummy variable = 1 if Sales worker, 0 otherwise
CLERICAL	Dummy variable = 1 if Clerical worker, 0 otherwise
SERVICE	Dummy variable = 1 if Other service worker, 0otherwise
NONDEF	Dummy variable = 1 if Non-defined occupation, 0 otherwise
REG1N	Dummy variable = 1 if Lives in the North region, 0 otherwise
REG2N	Dummy variable = 1 if Lives in the North-east region, 0 otherwise
REG3N [7]	Dummy variable = 1 if Lives in the South-east region, o otherwise
REG4N	Dummy variable = 1 if Lives in the South region, 0 otherwise
REG5N	Dummy variable = 1 if Lives in the central-west region, 0 otherwise
MIGRANT	Dummy variable = 1 if Not born in current state of residence, 0 otherwise
SOCSEC	Dummy variable = 1 if Job provides social security benefits, 0 otherwise
MATCH1	Dummy variable = 1 if strict matching between vocational schooling field of study and work, 0 otherwise
MATCH2	Dummy variable = 1 if wider matching between vocational field of study and work, 0 otherwise

[6] Omitted category in regressions.

[7] Omitted category in regressions.

4. Vocational Schooling, Occupation and Earnings

The empirical estimation reported in this paper focuses on three questions: To what extent are vocational school leavers employed in occupations related to their field of study in secondary school? Given the amount of matching, are there any earnings differences between those vocational school leavers that are employed in subjects related to their field of study and those that are not? How do the earnings of vocationally educated workers (in both matched and non matched occupations) compare with those of workers who studied in academic schools?

Education-Occupation Matchings

To examine the extent to which vocational schooling is related to occupation, we compare field of study with current job held, using 3-digit occupational codes. Two alternative matching criteria were employed, "strict" matching and "wider" matching. For strict matchings, a worker was defined as matched if he works in an occupation directly related to the vocational field of study; for example, the subject industrial electronics and the occupation electrical technician constitute a strict match. To account for career development, wider matchings add closely related occupations, for example an individual who received electronics at school might go on to become a technical salesman in an electrical business[6]. Table 4 shows the proportion of matched workers by field of study, according to the strict and wider matching criteria. Overall, 25.3 percent of vocational leavers were employed in occupations strictly related to the field of study. 40 percent were in matched occupations according to the wider criteria.

Examining strictly matched workers, the average earnings difference amounts to 11 percent; however the situation varies by field of study. With regard to wider matching, the average earnings difference increases to 37.2 percent, also varying by field of study. However, these figures represent gross differences which do not take into account other determinants of earnings and therefore must be interpreted with caution.

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[6] Details of the educational-occupational equivalences used in the matching procedure are available on request.

Table 4
Matched and Non-matched Vocational School Leavers in Private Sector Wage Employment
(Numbers, Mean monthly earnings and sds.)

Field of study	All Vocational School Leavers No.	Mean Earnings	Strict Matching % Match	Mean Earnings Match	Non-match	Wider Matching % Match	Mean Earnings Match	Non-Match
Industrial	82	28,469 (20,115)	57.3	27,907 (18,111)	29,223 (22,784)	69.5	28,567 (19,130)	28,268 (22,618)
Accounting	257	23,673 (23,482)	16.3	25,507 (18,759)	23,315 (24,319)	32.7	35,395* (30,537)	17,981 (16,463)
Other Vocational	68	17,967 (12,471)	20.6	20,074 (13,323)	17,420 (12,313)	30.9	16,290 (10,139)	18,716 (13,417)
All Vocational	407	23,686 (21,544)	25.3	25,864* (17,849)	22,948 (22,640)	40.0	30,512* (39,512)	19,172 (16,877)

* Significant at the .001 level. Differences between means were tested employing t-tests.

Earnings Functions Results for Vocational School Leavers

Earnings functions were estimated for the sample of vocational school leavers with the purpose of examining whether work in a study related field makes a significant contribution to their earnings. Table 5 presents the results. Column 1 shows the model with the strict match between field of study and work, and Column 2 shows the same model using the wider matching criteria.

The table shows clear labor market earnings advantages accruing to vocationally educated workers that are employed in occupations related to courses of study followed. For the strict-match model, the earnings differential is some 16 percent, while for the wider-match model the differential exceeds 27 percent. The stronger effect for the wider-match definition reflects subsequent career development, in a broader range of (better-payed) jobs.

Table 5
Earnings Functions. Brazilian Vocational Leavers
Full Time Private Sector Males
(dependent variable Ln monthly earnings)

Independent variables	Match1 Model coeff. (1)	t	Match2 Model coeff. (2)	t
Intercept	6.055*	8.56	6.007*	8.61
EXPER	0.078*	6.25	0.080*	6.47
EXPERSQ	-0.001*	3.69	-0.001	*4.01
YRSCHL	0.223*	3.67	0.220*	3.67
MATCH1	0.164*	2.02		
MATCH2			0.272*	3.67
SERVICE	-0.676*	3.94	-0.631*	3.71
FARMW	-0.339*	1.62	-0.291*	1.41
SALES	-0.103	0.94	-0.029	0.26
CLERICAL	-0.306*	3.86	-0.226*	2.74
NONDEF	0.290*	1.62	0.352*	1.98
REG1N	-0.281*	1.07	-0.288*	1.10
REG2N	-0.251*	2.80	-0.253*	2.86
REG4N	-0.035	0.40	-0.046	0.54
REG5N	-0.285*	2.42	-0.307*	2.65
SOCSEC	0.570*	3.22	0.545*	3.12
MIGRANT	0.130*	1.98	0.123*	1.90
R^2	0.393		0.407	
Number observations	406		406	

* Significant at the .001 level or better.

The results presented in Table 5 support the findings of other studies with regard to expected earnings outcomes of vocational school leavers when matched in relevant fields of employment. The coefficients of both the strict and the wider match indicate that vocational leavers who work in fields related to their studies do have higher earnings than those who do not.

Earnings Functions Results for Academic and Vocational Leavers

Earnings functions are estimated for the overall sample of secondary school leavers. The purpose of the analysis is to examine the comparative returns to vocational and academic study, and to examine whether work in a study related field makes a significant contribution to the earnings of the

vocational school leavers. Table 6 presents the results of the estimations. Column 1 shows a simple Mincerian model. Column 2 shows the full model with the strict match between field of study and work, while column 3 shows the same model, with the wider match dummy variable.

Table 6
Earningc Functions. Brazilian Full Time Males
Private Sector Workers
(dependent variable Ln monthly earnings)

Independent variables	Simple Model coeff. (1)	t	Match1 Model coeff. (2)	t	Match2 Model coeff. (3)	t
Intercept	6.694*	73.64	6.606*	68.97	6.603*	69.12
EXPER	0.104*	24.43	0.098*	23.35	0.098*	23.40
EXPERSQ	-0.001*	16.30	-0.001*	15.81	-0.001*	15.90
SPLYRSC2	0.190*	21.12	0.172*	19.52	0.172*	19.60
SPLYRSC3	0.214*	21.70	0.183*	17.70	0.175*	16.88
SPLYRSC4	0.179*	21.49	0.161*	19.28	0.155*	18.35
SPLYRSC5	0.175*	17.90	0.159*	16.44	0.155*	15.94
MATCH1			0.166*	2.20		
MATCH2					0.284*	4.34
SERVICE			-0.290*	7.93	-0.283*	7.74
FARMW			-0.279*	3.91	-0.276*	3.16
SALES			0.008	0.22	0.002	0.06
CLERICAL			-0.082	2.78	-0.068*	2.29
NONDEF			-0.032	0.57	-0.024	0.42
REG1N			-0.107	0.73	-0.112	0.76
REG2N			-0.238*	6.78	-0.238*	6.79
REG4N			-0.118*	3.73	-0.119*	3.75
REG5N			-0.143*	2.63	-0.150*	2.77
SOCSEC			0.426*	9.09	0.422*	9.03
MIGRANT			0.100*	4.20	0.100*	4.21
R^2	0.391		0.443		0.445	
Number obs.	2,742		2,742		2,742	

* Significant at the .001 level or better.

The results presented in Column 1 are closely in line with those from other countries and prior research in Brazil. Psacharopoulos (1986) estimates a return to schooling in Brazil of 19.2 percent in 1970. Dabos and Psacharopoulos (1987) estimate a 16.4 percent return to general secondary schooling and a 19.8 percent return to vocational secondary schooling, for the overall male Brazilian labor force in 1980. Note that the latter report does not indicate whether these returns are statistically different.

In our study, the comparison between the coefficients of the years of schooling by type of curricula indicates that there are no significant differences in the returns to schooling between academic and vocational fields of study, nor between the various vocational fields.

Results presented in Columns 2 and 3 include controls for additional background and labor market variables as well as the education-occupation match dummies. A positive and significant sign on the match variable would indicate that vocational leavers employed in study-related fields of work earn more than those who do not, and also earn more than those who pursued academic studies. The actual coefficients show that matched workers do obtain higher earnings than their non-matched counterparts: by about 16 percent for the strict matchings, and about 28 percent for the wider matchings [9]. The results of the regressions presented in Columns 2 and 3 indicate that while there is no difference in earnings between academic and vocational non-matched leavers, the earnings of those vocational leavers who work in study related occupations exceed those of their academic counterparts[10].

5. Summary and Conclusions

In the now extensive literature evaluating the labor market outcomes of vocational schooling in relation to more academic education, most studies focus on earnings differences without considering other intervening variables, such as the relevance of vocational studies to the type of occupation performed. The results reported in this paper for Brazil, which are parallel to those in recent similar studies for other countries, are far more favorable with regard to vocational schooling than is the traditional evaluation literature, particularly for developing countries. We find that the type of curriculum received in secondary school does not, in itself, have a significant impact on earnings. Vocational school completers and their academic counterparts have similar earnings outcomes when the vocational school leavers are employed in occupations unrelated to their field of study. It is vocational schooling combined with relevant occupation that is conducive to higher earnings. When vocational school leavers are employed in occupations related to their field of study, their earnings are significantly higher than those from the academic stream.

Our results point to the importance of broadening the scope of the evaluation studies on the labor market outcomes of vocational and academic secondary school leavers, to include more information on the occupation of vocational school completers, as well as on the employment environment generally. Yet while the traditional methodology can be criticized for generally failing to take

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[9] Given that we did not find significant differences in the returns to schooling between vocational fields, we did not test this relationship for each of the fields of study.

[10] In a recent paper, published after this research was completed, Tannen (1991) found no significant differences between the earnings of vocational and academic secondary school completers; though based on the same data set he did not draw the distinction matched and unmatched vocational school completers.

these issues into account, it does not necessarily follow that in all of these country case studies the negative findings regarding vocational education are faulty.

It is the case that in many developing countries, the employment environment is not favorable to vocational schooling[11]. Vocational schooling, by definition related to fairly narrow job skills, requires conditions of employment growth and buoyant demand for training skills, in order to meet its objectives in the economic and wider social sphere. However, the lack of modern employment sector growth in general and limited demand for specific vocational skills , together with higher unit costs of vocational schooling, combine to diminish the efficacy of vocational schooling in many developing countries. It would appear that an explanation for the more favorable outcomes for vocational education reported in recent studies for Hong Kong and Israel, as well as the results for the present study in Brazil, is to be found in the more favorable economic and employment environments in these middle income, industrializing countries.

[11] These issues are discussed more fully in Middleton, Ziderman and Adams (1992).

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